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INTERNATIONAL STANDARD

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Environmental testing –
Part 3-3: Supporting documentation and guidance – Seismic test methods for equipment~~s~~

INTERNATIONAL
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INTERNATIONAL ELECTROTECHNICAL COMMISSION

ENVIRONMENTAL TESTING –

Part 3-3: Supporting documentation and guidance – Seismic test methods for equipment~~s~~

FOREWORD

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International Standard IEC 60068-3-3 has been prepared by IEC technical committee 104: Environmental conditions, classification and methods of test.

This second edition cancels and replaces the first edition published in 1991. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) the main aim of this revision is to connect the testing level to the seismic activity level of the zone where the equipment could be installed;
b) a standard shape for the required response spectrum is also given for the general seismic class for which the seismic environment is either not known or is imprecisely known;
c) Clauses 11 to 15 were renumbered and some adjustments were made as their content is very general and the requirements can be applied both to the general seismic class and to the specific seismic class;
d) the word “envelope” is replaced with “dominance” and “to envelop” with “to dominate” in order to provide a more precise meaning from a mathematical point of view.

The text of this International Standard is based on the following documents:

FDIS	Report on voting
104/835/FDIS	104/841/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

This International Standard is to be used in conjunction with IEC 60068-1.

A list of all parts in the IEC 60068 series, published under the general title *Environmental testing*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document will be

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- withdrawn,
- replaced by a revised edition, or
- amended.

IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.

The contents of the corrigendum of September 2021 have been included in this copy.

INTRODUCTION

Guidance is included in each of the ~~three~~ two test methods referred to in this document but it is specific to the test method. The guidance in this document is directed towards choosing the appropriate test method and applying it to seismic testing.

~~This standard is to be used in conjunction with IEC 60068-1.~~

ENVIRONMENTAL TESTING –

Part 3-3: Supporting documentation and guidance – Seismic test methods for equipment~~s~~

1 ~~Object~~ Scope

This part of IEC 60068 applies primarily to electro-technical equipment but its application can be extended to other equipment and to components.

In addition, if some type of analysis is always performed when making a seismic qualification, for example for the choice of the representative sample to be tested or for the extension of the seismic qualification from the tested specimen to similar specimens, the verification of the performance of an equipment by analysis or by a combination of testing and analysis ~~may~~ can be acceptable but is outside the scope of this document, which is restricted to verification based entirely upon data from dynamic testing.

This document deals solely with the seismic testing of a full-size equipment which can be tested on a vibration table. The seismic testing of an equipment is intended to demonstrate its ability to perform its required function during and/or after the time it is subjected to the stresses and displacements resulting from an earthquake.

The object of this document is to present a range of methods of testing which, when ~~prescribed~~ specified by the relevant specification, can be applied to demonstrate the performance of equipment for which seismic testing is required with the main aim of achieving qualification.

NOTE Qualification by so-called “fragility-testing” is not considered to be within the scope of this document which has been prepared to give generally applicable guidance on seismic testing and specifically on the use of IEC 60068-2 test methods.

The choice of the method of testing can be made according to the criteria described in this document. The methods themselves are closely based on published IEC test methods.

This document is intended for use by manufacturers to substantiate, or by users to evaluate and verify, the performance of an equipment.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60068-1, *Environmental testing – Part 1: General and guidance*

IEC 60068-2-6, *Environmental testing – Part 2-6: Tests – Test Fc: Vibration (sinusoidal)*

IEC 60068-2-47, *Environmental testing – Part 2-47: Test – Mounting of specimens for vibration, impact and similar dynamic tests*

IEC 60068-2-57, *Environmental testing – Part 2-57: Tests – Test Ff: Vibration – Time-history and sine-beat method*

IEC 60068-2-64, *Environmental testing – Part 2-64: Tests – Test Fh: Vibration, broadband random and guidance*

IEC 60068-2-81, *Environmental testing – Part 2-81: Tests – Test Ei: Shock – Shock response spectrum synthesis*

ISO 2041, *Mechanical vibration, shock and condition monitoring – Vocabulary*

IEC 60068-3-3

Edition 2.0 2019-08

INTERNATIONAL STANDARD

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Environmental testing –
Part 3-3: Supporting documentation and guidance – Seismic test methods for equipment

Essais d'environnement –
Partie 3-3: Documentation d'accompagnement et recommandations – Méthodes d'essais sismiques applicables aux matériels

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COMMISSION ÉLECTROTECHNIQUE INTERNATIONALE

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ESSAIS D'ENVIRONNEMENT –

Partie 3-3: Documentation d'accompagnement et recommandations – Méthodes d'essais sismiques applicables aux matériels

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La Norme internationale IEC 60068-3-3 a été établie par le comité d'études 104 de l'IEC: Conditions, classification et essais d'environnement.

Cette deuxième édition annule et remplace la première édition parue en 1991. Cette édition constitue une révision technique.

Cette édition inclut les modifications techniques majeures suivantes par rapport à l'édition précédente:

a) le principal objectif de la présente révision est d'adapter le niveau d'essai au niveau d'activité sismique de la zone où le matériel est susceptible d'être installé;

b) une forme normalisée du spectre de réponse spécifié est également fournie pour la classe sismique générale pour laquelle l'environnement sismique n'est pas connu ou l'est de manière imprécise;

c) les Articles 11 à 15 ont été renumérotés et plusieurs ajustements ont été effectués car le contenu de ces articles est très général et les exigences peuvent s'appliquer aussi bien à la classe sismique générale qu'à la classe sismique spécifique;

d) le terme «enveloppe» est remplacé par «dominance» et «envelopper» par «dominer» afin d'expliciter ces termes du point de vue mathématique.

Le texte de cette Norme internationale est issu des documents suivants:

FDIS	Rapport de vote
104/835/FDIS	104/841/RVD

Le rapport de vote indiqué dans le tableau ci-dessus donne toute information sur le vote ayant abouti à l'approbation de cette Norme internationale.

Ce document a été rédigé selon les Directives ISO/IEC, Partie 2

La présente Norme internationale doit être utilisée conjointement avec l'IEC 60068-1.

Une liste de toutes les parties de la série IEC 60068, publiées sous le titre général *Essais d'environnement*, peut être consultée sur le site web de l'IEC.

Le comité a décidé que le contenu de ce document ne sera pas modifié avant la date de stabilité indiquée sur le site web de l'IEC sous "http://webstore.iec.ch" dans les données relatives au document recherché. A cette date, le document sera

- reconduit,
- supprimé,
- remplacé par une édition révisée, ou
- amendé.

Le contenu du corrigendum de septembre 2021 a été pris en considération dans cet exemplaire.

INTRODUCTION

Des recommandations sont incluses dans chacune des deux méthodes d'essai auxquelles il est fait référence dans le présent document, mais elles sont spécifiques à la méthode d'essai concernée. Les recommandations données dans le présent document visent à choisir la méthode d'essai appropriée et à s'appliquer aux essais sismiques.

ESSAIS D'ENVIRONNEMENT –

Partie 3-3: Documentation d'accompagnement et recommandations – Méthodes d'essais sismiques applicables aux matériels

1 Domaine d'application

La présente partie de l'IEC 60068 s'applique principalement au matériel électrotechnique mais son application peut s'étendre à d'autres matériels et composants.

Par ailleurs, si un certain type d'analyse est toujours effectuée lors de la réalisation d'une qualification sismique, par exemple pour choisir l'échantillon représentatif à soumettre à essai ou pour étendre la qualification sismique du spécimen soumis à essai à des spécimens similaires, la vérification des performances d'un matériel par l'analyse ou par une combinaison d'essais et d'analyses peut être acceptable mais elle n'entre pas dans le domaine d'application du présent document, qui se limite à la vérification uniquement fondée sur les données d'essais dynamiques.

Le présent document traite uniquement des essais sismiques d'un matériel grandeur nature qui peut être contrôlé sur une table vibrante. Les essais sismiques d'un matériel visent à démontrer sa capacité à remplir la fonction exigée pendant et/ou après la période durant laquelle il est soumis aux contraintes et déplacements résultant d'un séisme.

Le présent document a pour but de présenter un éventail de méthodes d'essai qui, lorsqu'elles sont stipulées par la spécification applicable, peuvent être appliquées pour démontrer les performances du matériel pour lequel des essais sismiques sont exigés, le but principal étant la qualification de ce matériel.

NOTE La qualification par un essai dit «essai de fragilité» n'est pas considérée comme entrant dans le domaine d'application du présent document qui a été établi pour fournir des recommandations généralement applicables aux essais sismiques, et plus spécifiquement pour l'utilisation des méthodes d'essai de l'IEC 60068-2.

La méthode d'essai peut être choisie en fonction des critères décrits dans le présent document. Les méthodes elles-mêmes sont étroitement liées aux méthodes d'essai publiées par l'IEC.

Le présent document s'adresse aux fabricants qui souhaitent fournir des preuves, ou aux utilisateurs soucieux d'évaluer et de vérifier, les performances d'un matériel.

2 Références normatives

Les documents suivants sont cités dans le texte de sorte qu'ils constituent, pour tout ou partie de leur contenu, des exigences du présent document. Pour les références datées, seule l'édition citée s'applique. Pour les références non datées, la dernière édition du document de référence s'applique (y compris les éventuels amendements).

IEC 60068-1, *Essais d'environnement – Partie 1: Généralités et lignes directrices*

IEC 60068-2-6, *Essais d'environnement – Partie 2-6: Essais – Essai Fc: Vibrations (sinusoïdales)*

IEC 60068-2-47, *Essais d'environnement – Partie 2-47: Essais – Fixation de spécimens pour essais de vibrations, d'impacts et autres essais dynamiques*

IEC 60068-2-57, *Essais d'environnement – Partie 2-57: Essais – Essai Ff: Vibrations – Méthode par accélérogrammes et sinusoïdes modulées*

IEC 60068-2-64, *Essais d'environnement – Partie 2-64: Essais – Essai Fh: Vibrations aléatoires à large bande et guide*

IEC 60068-2-81, *Essais d'environnement – Partie 2-81: Essais – Essai Ei: Chocs – Synthèse du spectre de réponse au choc*

ISO 2041*, Vibrations et chocs mécaniques, et leur surveillance – Vocabulaire*